

### Remarks

Claims 1 – 13 have been amended to more precisely claim the present invention. New claims 19 and 20 have been added. Support for these claim amendments and new claims can be found beginning in paragraphs [0039] to [0049] of the specification. Claims 14-18 have been canceled. Claims 1-13, 19 and 20 remain pending in the application.

### Amendments to Specification

The disclosure contained several informalities. The application has been amended to correct minor typographical errors, formatting inconsistency, inconsistent use of terminology throughout the specification, and other informalities. A substitute specification is enclosed. As required by 37 C.F.R. 1.125(c), clean and marked-up versions of the specification are enclosed. Applicant submits that the enclosed substitute specification contains no new matter.

### Drawings

The drawings had missing reference numerals that were mentioned in the specification. In addition, other informalities were found. Replacement drawing sheets are being submitted that add reference numerals identified in the specification, but previously omitted in the drawings. In addition, the replacement drawing sheets correct the other informalities. Applicant believes that no new matter has been added by these amendments. As such, the Applicant respectfully requests that the replacement drawing sheets be accepted by the Examiner.

### 35 U.S.C. §112

The Examiner rejected claims 1 – 18 under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. In addition, claims 7 and 8 were objected to for some informalities. The claims have been amended or canceled to overcome these objections. In view of the claim amendments and cancellations, the Applicant

respectfully requests that the objections to the claims under 35 U.S.C. 112, second paragraph and other informalities be withdrawn.

35 U.S.C. §101

Claims 14 – 18 were rejected under 35 USC 101 as being directed to non-statutory subject matter. In particular, the Examiner stated that the claims are directed to a memory not tangibly embodied in a manner so as to be executable and is thus non-statutory for failing to be in one of the categories of invention. The Applicant disagrees with the Examiner’s assertions concerning non-statutory subject matter of the claims; however, in the interest of expediting processing of this patent application claims 14-18 have been canceled. As such, the Applicant requests withdrawal of the rejection of the pending claims 35 USC 101 as being directed to non-statutory subject matter.

35 U.S.C. §102

The Examiner rejected claims 1, 8, and 14 under 35 U.S.C. 102(e) as being anticipated by Becker, et al. (U.S. Patent No. 5,878,223). Becker generally describes a predictive caching system. In contrast, the present invention as now claimed in amended independent claims 1 and 8 describes a method of predictive caching and predictive caching device that also uses delta encoding. In addition, the particular predictive caching algorithm claimed in claims 1 and 8 creates predictions based on information about the request and a referring page that indicates an object just previously requested by the client. In short, Becker does not teach predictive caching with delta encoding and does not teach creating predictions based on the request and the referring page as specified in independent claims 1 and 8.

Claims 2-7 depend from claim 1 and therefore are allowable over Becker for the same reasons that claim 1 is allowable. Claims 9-13, 19, and 20 depend from claim 8 and therefore are allowable over Becker for the same reasons that claim 8 is allowable.

Therefore, under 35 U.S.C. 102(e), Becker fails to teach the present invention as claimed in claims 1 and 8 and a notice of allowance is respectfully requested.

35 U.S.C. §103

Claims 1 – 18 were rejected under 35 USC §103(a) as being unpatentable over Mogul (U.S. Patent No. 5,802,292) in view of Mogul (HTTP Delta Clusters and Templates, Publication date: 24 August 2000). Applicant respectfully suggests that the Examiner has failed to establish a *prima facie* case of obviousness for two reasons. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference, or to combine the reference teachings. Secondly, the cited references, when combined, fail to teach or suggest all the claim limitations. In view of the amendments to independent claims 1 and 8 as well as dependent claims 2-7, 9-13, 19 and 20, Applicant respectfully suggests that Mogul '292 and Mogul when considered individually or together in combination, fail to suggest or teach all of the elements of the presently pending claims. For example, neither Mogul '292 nor Mogul teach creating predictions based on information about the request and a referring page that indicates an object just previously requested by the client as specified in independent claims 1 and 8.

Claims 2-7 depend from claim 1 and therefore are allowable over Mogul '292 and Mogul for the same reasons that claim 1 is allowable. Claims 9-13, 19, and 20 depend from claim 8 and therefore are allowable over Mogul '292 and Mogul for the same reasons that claim 8 is allowable.

Therefore, under 35 USC §103(a), Mogul '292 and Mogul fail to teach the present invention as claimed in claims 1-3, 19, and 20 and withdrawal of this rejection is respectfully requested.

The Applicant has reviewed the other references cited by Examiner and determined that they do not teach or suggest the present invention as claimed.

Conclusion

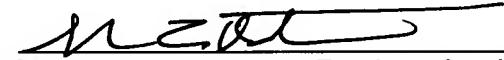
On the basis of the foregoing, Applicant respectfully submits that claims 1-13, 19, and 20 are now believed to be in condition for allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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P:\CLIENT FILES\G\DIGITAL RIVER D33\D33-023-01-US - PREDICTIVE PREDOWNLOAD OF TEMPLATES WITH DELTA CODING\050819 DRAFT RESPONSE TO OA.DOC



1 This application is filed in the name of the following inventor:

2

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Citizenship

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3

4 The assignee is Fireclick, Inc., a corporation having an office at 289 South  
5 San Antonio Road, Los Altos, CA 94022.

6

7 TITLE OF THE INVENTION

8

9 PREDICTIVE PREDOWNLOAD OF TEMPLATES WITH DELTA ENCODING

10

RELATED APPLICATIONS

11 This application claims the benefit of U.S. Patent Application Serial No. 09/734,910,  
12 filed 11 December 2000, entitled "Predictive Pre-download Using Normalized Network  
13 Object Identifiers."

14 This application is related to U. S. Patent Application Serial No. 10/058,232, filed 19  
15 October 2001, entitled "Differential Caching with Many-to-One and One-to-Many  
16 Mapping."

17 BACKGROUND OF THE INVENTION

18

19 Field of the Invention

20

1 The invention relates to delivering web pages and other objects from a server, using  
2 techniques such as predictive predownload and delta encoding.

3

4

5

6

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8 Description of Related Art

9

10 When serving web pages and other objects from a web server, it is advantageous to  
11 substantially minimize the amount of time needed to send those objects from the server  
12 to the requesting client (also known as a browser).

13

14 One method includes attempting to maintain template information already known to the  
15 client, and to send only delta information from the server to the client. However, the  
16 template information must be determined and sent to the client after the client has  
17 requested a corresponding web page. This method suffers from the drawback that it  
18 does not substantially minimize the amount of time required to present the page to a  
19 client as because the template information, the delta information (or both) are not sent  
20 to the client as soon as possible.

21

22 Another method is to predownload web pages or other objects from the server to the  
23 client. This method includes selecting one or more next objects the client is likely to  
24 request, and sending those next objects from the server to the client in a predownload  
25 time before the client actually requests those next objects. However, this suffers from  
26 the drawback that if the selected next objects take a relatively long time to predownload,

- 1 there is a substantial chance they might not be fully received before the client makes its
- 2 next request.

1                   BRIEF SUMMARY OF THE INVENTION

2  
3     The invention includes a method and system which substantially minimizes the time  
4     needed to send and present objects from a server to a client, such as by using  
5     techniques for predictive predownload of templates with delta encoding. In one  
6     embodiment, a template builder generates a set of templates for each web page or  
7     other object. A prediction engine maintains a prediction map, responsive to web pages  
8     and other objects, the objects including the templates for web pages. The prediction  
9     engine selects one or more next objects likely to be requested by the client making the  
10    particular request, such as a next object or an object embedded in or referenced by a  
11    page. A delta encoder for a web page determines delta information in response to a  
12    current version of that page, and template information for that page, and encodes the  
13    web page for delivery to the client using the template information and delta information.  
14    The client is able to present the object in response to both the template information and  
15    delta information.

16

## 17                   BRIEF DESCRIPTION OF THE DRAWINGS

18

19    Figure 1 shows a block diagram of a system including techniques involving predictive  
20    predownload of templates with delta caching.

21

22    Figure 2 shows a process flow diagram of a method of operation of a system including  
23    techniques involving predictive predownload of templates with delta caching.

1                   **INCORPORATED DISCLOSURES**  
2

3                 Inventions described herein can be used in conjunction with technology  
4         described in the following documents:

5

6         • U.S. Patent Application Serial No. 09/734,910, (Express Mail Mailing No. EL 768  
7                 961 028US), filed December 11, 2000, in the name of Stephane KASRIEL, attorney  
8                 docket number 155.1002.01, titled "Predictive Pre-download Using Normalized  
9                 Network Object Identifiers", and applications claiming priority therefrom.

10

11         • U.S. Patent Application Serial No. 10/058,232, (Express Mail Mailing No. EL 734  
12                 815 560 US), filed October 19, 2001, in the name of Stephane KASRIEL, attorney  
13                 docket number 155.1008.01, titled "Differential Caching with Many-to-One and One-  
14                 to-Many Mapping", and applications claiming priority therefrom.

15

16                 These documents are hereby incorporated by reference as if fully set forth  
17         herein, and are sometimes referred to herein as the "incorporated disclosures."

18

19                   **DETAILED DESCRIPTION OF THE INVENTION**  
20

21         The description herein includes a preferred embodiment of the invention, including  
22         preferred data structures and process steps. Those skilled in the art would realize after  
23         perusal of this application, that embodiments of the invention might be implemented  
24         using a variety of other techniques not necessarily specifically described herein, without

1 undue experimentation or further invention, and that such other techniques would be  
2 within the concept, scope, and spirit of the invention.

3

4 **Lexicography**

5

6 The following terms relate or refer to aspects of the invention or its embodiments. The  
7 general meaning of each of these terms is intended to be illustrative and in no way  
8 limiting.

9

10 **client and server** — These terms refer to a relationship between two elements in a  
11 system (whether actual hardware devices, software elements, or some combination  
12 thereof), particularly to their relationship as client and server, not necessarily to any  
13 particular physical devices.

14

15 For example, but without limitation, a particular client (whether a hardware device or a  
16 software element) in a first relationship with a first server, can also be a server in a  
17 second relationship with a second client.

18

19 **client device and server device** — These terms refer to devices taking on the role of a  
20 client or a server in a client-server relationship (such as an HTTP web client and web  
21 server). There is no particular requirement that any client devices or server devices  
22 must be individual physical devices, or even that they must be hardware entities. They  
23 can each be a single device, a set of cooperating devices, a portion of a device, a single  
24 software element, a set of cooperating software elements, a portion of a software  
25 element, or some combination thereof.

26

1   **web server** — This refers to a server capable of providing web objects, including web  
2   pages and data elements embedded therein, to requesting clients.

3

4   **delivery** — in general, sending a web page from a web server to a web client.

5

6   **delta information, delta encoding, encoding for delivery** — as used herein, the term  
7   “delta information” refers to a selected portion of a web page that may vary between  
8   instances of the web page. Delta encoding and encoding for delivery refer to a process  
9   wherein a device determines template information and delta information, provides  
10   mapping functions between template URLs and server URLs, delivers information that  
11   will be subsequently integrated into a web page or other document for delivery to an  
12   end user and provides a transparent interface between a client device and a server.

13

14   **object embedded in or referenced by a web page** — in general, an object embedded  
15   in or referenced by a web page includes links to other information such as other web  
16   pages.

17

18   **prediction engine, prediction map** — in general, a prediction engine selects one or  
19   more objects likely to be requested by the client making the particular request, such as  
20   a next page or an object embedded in or referenced by a page. A prediction map,  
21   responsive to web pages and other objects is maintained by the prediction engine.

22

23   **pre-download** — in general, to download an object to a client device at a point in time  
24   before the object is requested by a client.

25

26   **template information, template builder** – in general, the term “template information”  
27   refers to a selected portion of a web page that is relatively unchanging. If there is no

1 difference between different instances of a web page, then the entire page may  
2 composed of template information. A “template builder” refers to a technique for  
3 determining template information. De-coupling the service of template information from  
4 the service of delta information to a client increases the overall speed of serving the  
5 web page.

6

7 **web objects** – in general, web pages, data elements embedded in web page and  
8 elements of web pages such as template information and delta information.

9

10 The scope and spirit of the invention is not limited to any of these definitions, or to  
11 specific examples mentioned therein, but is intended to include the most general  
12 concepts embodied by these and other terms.

13

14 **System Elements**

15

16 Figure 1 shows a block diagram of a system including techniques involving predictive  
17 predownload of templates with delta encoding.

18

19 A system 100 includes a set of clients 110, a communication network 120, a server 130,  
20 and a predownloader 140. Although the system 100 is described herein with regard to  
21 a single client 110 and a single server 130, those of ordinary skill in the art would  
22 understand, after perusal of this application, that the system 100 can also include  
23 multiple clients 110, multiple servers 130, or some combination thereof. Moreover,  
24 although the system 100 is described with regard to requests for web objects, such as  
25 using the HTTP protocol (hypertext transfer protocol) or a variant thereof, those of  
26 ordinary skill in the art would understand, after perusal of this application, that the  
27 system 100 can also or alternatively include other client/server relationships, and  
28 requests for other types of objects.

1  
2 There is no particular requirement that clients 110 are all of the same type or servers  
3 130 are all of the same type. For one example, some clients 110 might use Microsoft's  
4 "Internet Explorer" web browser, while other clients 110 might use the open source  
5 "Opera" web browser. For another example, some servers 130 might use the open  
6 source "Apache" web server, while other servers 130 might use another web server.

7  
8 There is no particular requirement that objects being requested, or protocols used to  
9 request them, are all of the same type. For example, web objects might be requested  
10 using FTP (file transfer protocol), HTTP, or variants thereof. File objects might be  
11 requested using FTP, NFS (network file system), or variants thereof. Database objects  
12 might be requested using SQL (structured query language), CORBA (common object  
13 request broker architecture), or variants thereof.

14  
15 Each web client 110 includes a processor, program and data memory, mass storage,  
16 input elements (such as a keyboard or a mouse or other pointing device) and output  
17 elements (such as a monitor or other display and a speaker), and a client cache 111,  
18 and is controlled by a user 112. The processor, program and data memory, and mass  
19 storage operate in conjunction to perform the functions of a web client 110 (also known  
20 as a web "browser"). The web client 110 generates outgoing messages 113 including  
21 requests for web objects, which it sends to the web server 130, and receives incoming  
22 messages 113 including responses to those requests, which can include data from web  
23 objects. In one embodiment, the web client 110 uses the HTTP protocol or a variant  
24 thereof, but as noted above, other protocols can also or alternatively be used. The  
25 client cache 111 includes a portion of the data memory or mass storage, and is capable  
26 of storing copies of data from web objects.

27  
28 Each web client 110 is coupled to the communication network 120. In one embodiment,  
29 the communication network 120 includes at least a portion of an Internet, intranet,

1 extranet, virtual private network, enterprise network, another form of communication  
2 network, or any other network, system, or technique capable of routing messages  
3 between and among one or more web clients 110 and web servers 130.

4

5 Each server 130 includes a processor, program and data memory, and mass storage.  
6 The data memory and mass storage are capable of storing objects 131, such as web  
7 pages, text, images, sounds, programs or program fragments, style-sheets, scripts, and  
8 other forms of data. Each object 131 can include one or more links 132 to other objects  
9 131 (such as other web pages), and can also or alternatively include one or more  
10 embedded objects (such as embedded images, scripts, or other data). One or more of  
11 the servers 130 can also include input elements (such as a keyboard or a mouse or  
12 other pointing device) and output elements (such as a monitor or other display and a  
13 speaker), and be controlled by an operator 133.

14

15 The processor, program and data memory, and mass storage operate in conjunction to  
16 perform the functions of a server 130. In one embodiment, one or more of the servers  
17 130 includes a plurality of devices each capable of acting as a server, cooperating using  
18 a load-sharing or other distribution technique for dividing the work of responding to  
19 requests among them, and jointly controlled by a single operator 133. Where multiple  
20 devices operate together, the server 130 can also be referred to as a "server farm".

21

22 The server 130 receives incoming messages 113 including requests for objects, and  
23 generates outgoing messages 113 including responses to those requests, which can  
24 include data from web objects. In one embodiment, the server 130 uses the HTTP  
25 protocol or a variant thereof, but as noted above other protocols can also or alternatively  
26 be used.

27

28 The predownloader 140 includes a delta encoder 141, a template builder 142, a  
29 predictor 143, a set of template information 144, and a set of prediction information 145.

1 Although the predownloader 140 is described herein as a single device, those of  
2 ordinary skill in the art would recognize, after perusal of this application, that the  
3 predownloader 140 can be embodied as one or more devices, and including one or  
4 more elements such as the delta encoder 141, the template builder 142, and the  
5 predictor 143.

6

7 There is no particular requirement that the delta encoder 141, the template builder 142,  
8 and the predictor 143 are embodied in the same device or element. There can be a  
9 separate device or element for each of them or some of them. For example, in one  
10 embodiment, the delta encoder 141 and the predictor 143 can be embodied in a first  
11 device, while the template builder 142 is embodied in a second device.

12

13 There is no particular requirement that the delta encoder 141, the template builder 142,  
14 and the predictor 143 are each single devices or elements. There can be a multiple  
15 devices or elements, or some combination thereof, for each of them or some of them.  
16 For example, in one embodiment, there can be multiple delta encoders 141, multiple  
17 predictors 143, and one template builder 142.

18

19 There is no particular requirement that the template information 144 or the prediction  
20 information 145 are recorded in single databases. There can be a multiple copies of  
21 either or both of them, or there can be separate (and possibly different) copies of either  
22 or both of them, or some combination thereof. For example, in one embodiment, there  
23 can be multiple copies of the same template information 144 collectively used by  
24 different servers 130 (with similar data), while there is a separate set of prediction  
25 information 145 for each server 130.

26 From the server 130, the delta encoder 141 receives data for an object 131 to be  
27 delivered to a client 110. The delta encoder 141 determines if there is a stored template  
28 for the object 131 in the template information 144. The delta encoder 141 calculates  
29 delta information for the object 131, responsive to the object 131 and responsive to the

1 template information 144. The delta encoder 141 generates a message 113 to the  
2 client 110 including the delta information and specifying the template it used. The client  
3 110 is capable of presenting the object 131 in response to the message 113, by  
4 reconstructing the object 131 in response to the delta information and a template in the  
5 client cache 111. If the client cache 111 does not contain the template, the client 110 is  
6 capable of receiving that template from the server 130 and then reconstructing the  
7 object 131.

8

9 The delta encoder 141 calculates the size of the delta information it calculates for each  
10 object 131, and determines in response to that size, in response to a size for the object  
11 131 itself, and in response to a threshold value (possibly set by the operator 133)  
12 whether the delta information is larger than it "should be." If so, the delta encoder 141  
13 so informs the template builder 142 (using any available technique), thus allowing the  
14 template builder 142 to calculate a new template for the object 131. There is no  
15 particular requirement for the delta encoder 141 to use any particular technique for so  
16 informing the template builder 142; it can use a flag or other information in a database  
17 record (including for example marking the template "obsolete"), an interprocess  
18 message (including a remote procedure call in systems 100 where the delta encoder  
19 141 and the template builder 142 are not executing on the same hardware device), a  
20 network message (such as a message 113 in the system 100), or any other technique  
21 capable of allowing the template builder 142 to understand the results of the calculation  
22 by the delta encoder 141.

23 The template builder 142 calculates templates for selected objects 131 and records, ~~in~~  
24 ~~the template information 144~~, one or more of those templates for each of the selected  
25 objects 131 in the template information 144. Thus, the template information 144 can  
26 include multiple templates for one selected object 131 (such as for, For example, if that  
27 object 131 has been changed more than once recently). Alternatively, template  
28 information 144 can include one template for a group of more than one selected object  
29 131 (such as if when those objects 131 have similar information), or some combination

1    thereof. In one embodiment, the template builder 142 marks each object with a  
2    calculated template with a pointer to, that template or other indicator for, that template.

3    In a first embodiment, the template builder 142 calculates templates in response to  
4    information from the delta encoder 141, indicating that the delta information for a  
5    selected object 131 is larger than it "should be." In a second embodiment, the template  
6    builder 142 calculates templates in response to changes in selected objects 131 as  
7    each such object 131 is changed at the server 130. In a third embodiment, the template  
8    builder 142 calculates templates for all selected objects 131 in a sweep across the  
9    entire set of such objects 131 maintained by the server 130. Selected objects 131 can  
10   include all objects 131 at the server 130, or a subset thereof, where the subset is  
11   determined in response to one or more of the following:

12   **object age** — Templates are calculated for objects 131 changed more recently than, or  
13   which are older than, a selected threshold (possibly set by the operator 133), or some  
14   combination thereof.

15

16   **object size** — Templates are calculated for objects 131 larger than, or smaller than, a  
17   selected threshold (possibly set by the operator 133), or some combination thereof.

18

19   **object type** — Templates are calculated for objects 131 having one of a first set of  
20   selected types, or not having one of a second set of selected types (possibly set by the  
21   operator 133), or some combination thereof. For just one example, templates might be  
22   calculated for all text objects, but for no sound objects.

23

24   **operator selection** — Templates are calculated for objects 131 selected by the  
25   operator 133, individually or in groups.

26

1 Those of ordinary skill in the art would recognize, after perusal of this application, that  
2 any one or more of these embodiments, or some combination thereof, might be used in  
3 the system 100.

4

5 The predictor 143 receives the identity of objects 131 requested by the client 110 (such  
6 as by receiving copies of the messages 113 requesting those objects 131). In one  
7 embodiment, each such message 113 includes a "referring page," indicating the object  
8 131 just previously requested by the client 110. Using aggregates of this information,  
9 the predictor 143 constructs a directed graph of likelihood information, indicating for  
10 each object 131, what next objects 131 are most likely and what is their relative  
11 likelihood. The predictor 143 can also or alternatively operate by predicting next objects  
12 131 in response to any links 132 present in each object 131, in response to aggregate  
13 information for which objects 131 are most likely to be requested independent of the  
14 referring page, ~~or in response to other information as further described in the~~  
15 ~~incorporated disclosures.~~

16

17 As noted above, if a client 110 receives delta information but does not have  
18 corresponding template information, that client 110 can request the associated template  
19 from the server 130. ~~In one embodiment, further described in the incorporated~~  
20 ~~disclosures, the~~The associated template includes a script that can be executed by the  
21 client 110, and therefore can be treated by the predictor 143 like any other next object  
22 131. In systems 100 where the associated template does not include a script (such as  
23 for example where delta encoding is performed using an extension or modification of  
24 the HTTP protocol), templates for each object 131 are still treated as next objects 131  
25 that can be next requested by clients 110, and whose likelihood of being requested is  
26 calculated by the predictor 143.

27

28 In response to the predictor 143, the client 110 and the server 130 cooperate to pre-  
29 download (for example, to download to the client 110 and store in the client cache 111

1 before the user 112 specifically requests that object 131) the template for the object  
2 131. In a first embodiment, the predictor 143 embeds a "hint" in the response message  
3 113 to the client 110, suggesting a next object 131 to request if there is any idle time  
4 before the user specifically requests an object 131. In a second embodiment, the  
5 server 130 can generate a message 113 delivering the predicted next object 131,  
6 independently of an explicit request, which the client 110 stores in the client cache 111.  
7 Those of ordinary skill in the art, after perusal of this application, would recognize that  
8 the client 110 and the server 130 can operate in many different ways to pre-download  
9 the predicted next object 131 to the client 110 and store it in the client cache 111, and  
10 that all such techniques are within the scope and spirit of the invention.

11

12 In some embodiments, the client 110 and the server 130 can cooperate to deliver a  
13 compressed version of the delta information, the template information, or both, from the  
14 server 130 to the client 110. Delivering a compressed version of an object 131 can  
15 include either an extension or modification of the HTTP protocol, or can include other  
16 techniques; these are both further described in the incorporated disclosures. The  
17 system 100 can flexibly perform compression, including compressing only the delta  
18 information, only the template information, or compressing each separately, as further  
19 described in the incorporated disclosures.

20

21 **Method of Operation**

22

23 Figure 2 shows a process flow diagram of a method of operation of a system including  
24 techniques involving predictive predownload of templates with delta caching.

25

26 A method 200 is performed by the system 100. Although the method 200 is described  
27 serially, the steps of the method 200 can be performed by separate elements in  
28 conjunction or in parallel, whether asynchronously, in a pipelined manner, or otherwise.

1 There is no particular requirement that the method 200 be performed in the same order  
2 in which this description lists the steps, except where so indicated.

3

4 At a flow point 210, predownloader 140 is ready to receive a request for an object 131.

5

6 At a step 211, the predownloader 140 receives a request message 113 from a client  
7 110 for an object 131 from the server 130. The request message 113 includes a  
8 requested URL.

9

10 At a step 212, the predownloader 140 provides the requested URL to the delta encoder  
11 141.

12

13 At a step 213, the predownloader 140 receives a referring-page URL, included in the  
14 request message 113.

15

16 At a step 214, the predownloader 140 provides the referring-page URL and the  
17 requested URL to the predictor 143.

18

19 At a step 221, the delta encoder 141 receives the requested URL included in the  
20 request message 113 from the predownloader 140.

21

22 At a step 222, the delta encoder 141 searches template information 144 and determines  
23 if there is a template for the object 131.

24

25 At a step 223, the delta encoder 141 calculates delta information for the object 131.

1 At a step 224, the delta encoder 141 determines whether the delta information for the  
2 object 131 is too large. In the event that the delta information for object 131 is too large,  
3 the delta encoder 141 informs the template builder 142 that the delta information for the  
4 object 131 is too large and a new template is generated.

5

6 At a step 225, the delta encoder 141 attaches any predownload hint information for the  
7 object 131, from the prediction information 145.

8

9 At a step 231, the template builder 142 calculates a template for the object 131 (if  
10 needed), and records that template in the template information 144.

11

12 At a step 241, the predictor 143 receives the referring-page URL and the requested  
13 URL from the predownloader 140. The referring-page URL and the requested URL  
14 and are included in the message 113.

15

16 At a step 242, the predictor 143 calculates, in response to the referring-page URL and  
17 the requested URL, the likeliest next objects 131 for the object 131. The likeliest next  
18 objects include those objects associated with the object 131 that the user 112 is likely to  
19 request.

20

21 At a step 243, the predictor 143 updates the prediction information for the object 131,  
22 including predownload hint information for the object 131.

23

24 At a flow point 250, the predownloader 140 is done with the request. The method 200  
25 continues at the flow point 210, where it is ready to receive another request.

26

## **Alternative Embodiments**

27

1 Although preferred embodiments are disclosed herein, many variations are possible that  
2 remain within the concept, scope, and spirit of the invention. These variations would  
3 become clear to those skilled in the art after perusal of this application.

4

5 Those skilled in the art would realize that any alternative embodiments described herein  
6 are illustrative, and in no way limiting.